Note on the Formulæ for Star Corrections. By P. H. Cowell, M.A.

The following method of obtaining the formulæ used in star corrections appears to me simpler than that usually given in text books.

(i.) Precession and Nutation.

Some rotation will bring the pole and equinox of date into coincidence with the mean pole and equinox for the beginning of the year. Let this rotation be resolved into components :

D round the first point of *Aries* ;
C round the pole of the prime celestial meridian ;
f round the pole of the equator.

D, C, f are therefore day-numbers independent of the particular star.

Then for a particular star, whose R.A. and declination are α and δ, the rotation may be farther resolved into

C sin α + D cos α about the projection of the direction of the star upon the equator ;
C cos α − D sin α about the pole of the meridian through the star ;
f about the pole of the equator.

The geometrical effects of these last-named rotations are

$(C \sin \alpha + D \cos \alpha)\ \frac{1}{15} \tan \delta$	in R.A.
$C \cos \alpha - D \sin \alpha$	in Decl.
f	in R.A.

(ii.) Aberration.

The effect of aberration is the same as that of a displacement of the observer. This displacement may be resolved into components :

B towards the first point of *Aries* ;
A towards the pole of the prime celestial meridian ;
i towards the pole of the equator.

B, A, i are therefore day-numbers independent of the particular star.

Then for a particular star the displacement may be further resolved into

A sin α + B cos α along the projection of the direction of the star upon the equator ;
A cos α − B sin α at right angles to the meridian of the star ;
i towards the pole of the equator.

The geometrical effects of these displacements are

$$\begin{aligned} &-(A \sin \alpha + B \cos \alpha) \sin \delta \quad \text{in declination;} \\ &(A \cos \alpha - B \sin \alpha) \tfrac{1}{15} \sec \delta \text{ in R.A.;} \\ &i \cos \delta \qquad\qquad\qquad \text{in declination.} \end{aligned}$$

Combining the two results, and reversing the signs of some of the day-numbers, we have the well-known formulæ:

Apparent R.A.—Mean R.A.

$$\begin{aligned} &= A \tfrac{1}{15} \cos \alpha \sec \delta + B \tfrac{1}{15} \sin \alpha \sec \delta \\ &+ C \tfrac{1}{15} \sin \alpha \tan \delta + D \tfrac{1}{15} \cos \alpha \tan \delta + f. \end{aligned}$$

Apparent Declination—Mean Declination.

$$\begin{aligned} &= - A \sin \alpha \sin \delta + B \cos \alpha \sin \delta \\ &\quad + C \cos \alpha \quad - D \sin \alpha + i \cos \delta \end{aligned}$$

where it should be observed that C has a slightly different meaning to that assigned to it in the *Nautical Almanac* (see Turner's Star Correction Tables).

This method of treatment assigns geometrical meanings to the day-numbers, and from their geometrical meaning some of their numerical properties are easily recalled; for instance:

D is the nutation in obliquity, and its principal term has a nineteen-year period;

C, f are components of the precession and nutation in longitude. As these are together equivalent to a rotation about the pole of the ecliptic (except for the minute planetary precession), it follows that $C = f \tan \epsilon$, nearly, when ϵ is the obliquity of the ecliptic, or $C = \frac{2}{5} f$, nearly.

Moreover C, f alone of the day-numbers change suddenly at the turn of the year, and contain a term proportional to the fraction of the year. The principal parts of the remainders of C and f, and the principal part of D, are of nineteen years' period, and depend, as is well known, on the fact that the lunar precession is equivalent to a rotation round the pole of the Moon's orbit, which revolves in nineteen years round the pole of the ecliptic.

A, B, i are components of a vector the extremity of which describes the hodograph of the Earth's orbit. This hodograph is a circle; the vector represented by A, B, f, is not drawn from the origin but from the centre of the circle. The Earth's velocity is the resultant of two components, one of which is a constant, and produces an aberration whose value for stars 90° distant from its apex is $\frac{1}{3}''$, while the other component is constant in magnitude and at right angles to the Earth's radius vector. It is perhaps not familiar to everyone that, when an apparent place is corrected for aberration by the ordinary formulæ, the mean place is not that in which the star would appear were the Earth at

rest, or the velocity of light infinite, but it remains affected by the aberration due to a velocity parallel to the minor axis of the Earth's orbit.

A, i have a resultant in the plane of the ecliptic, and therefore $i = \frac{2}{5}$ A, nearly ; also A, i vanish at the solstices, while B vanishes at the equinoxes.

In connection with the uncorrected portion of the aberration, it may be further remarked that a planet is completely corrected for aberration by antedating the observation, so that there is a discordance of $\frac{1}{3}''$ in the method of treating the two classes of bodies.

Partial Eclipse of the Sun, 1900 *May* 28, *observed at Col. Cooper's Observatory, Markree.* By F. W. Henkel, B.A.

The weather being very fine here, the progress of the eclipse was watched under favourable circumstances.

The maximum obscuration was at about 3.45 P.M. G.M.T., and magnitude of eclipse ·7.

The last contact took place at $4^{h}\ 49^{m}\ 25^{s}$ G.M.T. There was a slight falling off of light observable during the time of greatest obscuration.

The sunshine record for this date gives a graphic picture of the eclipse (or rather the uneclipsed portion of the Sun), shown by the narrowing down of the trace and its subsequent widening again during the progress of the phenomenon. The Merz "Comet Seeker," with dark glasses, was the instrument used to watch the eclipse.

Discovery and Observations of Comet Brooks (b 1900). By W. R. Brooks, M.A., D.Sc.

While engaged in sweeping the eastern heavens with the $10\frac{1}{4}$-inch refractor on the early morning of July 23, I discovered a new, bright, telescopic comet in *Aries*. Its position was as follows : July 23, 13^{h}, Eastern standard time ; R.A., $2^{h}\ 43^{m}\ 40^{s}$; declination north, $12^{\circ}\ 30'$. The motion was rapid, about 3° daily, and almost due north. The comet had a bright stellar nucleus and a tail. It was really a very beautiful telescopic object, resembling a great naked eye comet in miniature.

In drawing fig. 1 I show its normal appearance shortly after discovery, which was maintained with very slight variation until the full moon interfered with the almost continuous obser-